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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/562,618

05/15/2006

Jan Boer

Boer 7-3-2-3

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EXAMINER

CASCA, FRED A

ART UNIT

PAPER NUMBER

2617

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11/26/2010

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/562,618	Applicant(s) BOER ET AL.	
	Examiner FRED A. CASCA	Art Unit 2617	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 August 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-34 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 and 11-34 is/are rejected.
- 7) ☒ Claim(s) 10 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This action is in response to applicant's amendment filed on August 30, 2010. Claims 1-34 are still pending in the present application.
2. In view of the Appeal Brief filed on August 31, 2009, PROSECUTION IS HEREBY REOPENED. A new ground of rejection is set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) initiate a new appeal by filing a notice of appeal under 37 CFR 41.31 followed by an appeal brief under 37 CFR 41.37. The previously paid notice of appeal fee and appeal brief fee can be applied to the new appeal. If, however, the appeal fees set forth in 37 CFR 41.20 have been increased since they were previously paid, then appellant must pay the difference between the increased fees and the amount previously paid.

A Supervisory Patent Examiner (SPE) has approved of reopening prosecution by signing below:/Patrick N. Edouard/

Supervisory Patent Examiner, Art Unit 2617

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

Art Unit: 26173

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-7, 11-16 and 21-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Background Disclosure in the Specification, particularly Figures 1-3 and page 4, line 18 through page 5, line 19 (herein Admitted Art) in view of Shattil (US 2004/0141548 A1).

Referring to claim 1, Admitted Art discloses a method for transmitting one or more symbols in a multiple antenna wireless communication system (Fig. 1-3 and Page 5, lines 5-10, "MIMO-OFDM"), said method comprising the step of:

loading subcarriers from said one or more symbols across a plurality of antennas in said multiple antenna wireless communication system (Figures 1-3 and page. 5, lines 5-16, note that subcarriers are interleaved in OFDM subcarriers).

Admitted Art does not specifically disclose that the symbols are loaded diagonally.

In an Analogous art, Shattil discloses that symbols are loaded into subcarriers diagonally (Fig. 9A and Par. 0163).

It would have been obvious to a person of ordinary skill in the art at the time of invention to modify the Admitted Art such that symbols are loaded diagonally into the subcarriers, for the purpose of minimizing interference and thus providing improving the quality of transmitted signal.

Referring to claim 2, the combination of Admitted Art and Shattil discloses the method of claim 1, and further discloses said one or more symbols are long training symbols based on a single-antenna long training symbol and wherein each subsequent subcarrier from said single-antenna long training symbol is positioned in a long training symbol for a logically adjacent antenna (Admitted Art, Fig. 3, and page 5, lines 5-10, "long training symbols", note that in OFDM long training symbols are inherently based on a single antenna. Further, the diagonal loading of symbols in Shattil implies that each subsequent subcarrier from said single-antenna long training symbol is positioned in a long training symbol for a logically adjacent antenna)

Referring to claim 3, the combination of Admitted Art and Shattil disclose the method of claim 2, wherein said single-antenna long training symbol is an 802.11 a/g long training symbol (Admitted Art, Page 5, lines 5-6, "IEEE 802.11 a/g").

Referring to claim 4, the combination of Admitted Art and Shattil disclose the method of claim 1, wherein said one or more symbols are short training symbols based on a single-antenna short training symbol and wherein each subsequent subcarrier from said single-antenna short training symbol is positioned in a short training symbol for a logically adjacent antenna (Admitted Art, Fig. 3, and page 5, lines 5-10, "short training symbols").

Referring to claim 5, the combination of Admitted Art and Shattil disclose the method of claim 4, wherein said single-antenna short training symbol is an 802.11 a/g short training symbol (Admitted Art, Fig. 3, and page 5, lines 5-10).

Referring to claim 6, the combination of Admitted Art and Shattil discloses the method of claim 1, wherein said multiple antenna wireless communication system is a MIMO-OFDM system (Admitted Art, Fig. 1-3 and page. 5, lines 2-3).

Referring to claim 7, the combination of Admitted Art and Shattil discloses the method of claim 1, further comprising the step of inserting one or more additional subcarriers in at least one of said plurality of symbols (Admitted Art, page 4, line 20 through page 5, line 10, note that inserting additional subcarriers is inherent in OFDM).

Referring to claim 11, the combination of Admitted Art and Shattil disclose the method of claim 1, wherein said one or more symbols are a SIGNAL-field symbol (Admitted ART, page 5, lines 10-19, note that preamble and data fields are inherent in OFDM channel estimation).

Referring to claim 12, the combination of Admitted Art and Shattil discloses the method of claim 11, wherein said SIGNAL-field symbol includes a system type indicator (page. 4 and , note that the preamble has system type information).

Referring to claim 13, the combination of Admitted Art and Shattil discloses the method of claim 2, wherein a number of said long training symbols is a function of the number of transmitters (Page. 4 and Fig. 1-3).

Referring to claim 14, the combination of Admitted Art and Shattil discloses the method of claim 1, further comprising the steps of diagonally loading a remainder of a header of a packet across said logically adjacent antennas; and diagonally loading data sequences of said packet across said logically adjacent antennas (Fig. 1-3, and pages 4, line 20- page 5, line 18).

Art Unit: 26176

Referring to claim 15, the combination of Admitted Art/Shattil discloses the method of claim 1, wherein said plurality of antennas are logically adjacent (page 5, line 2, note that in MIMO antennas are logically adjacent).

Referring to claim 16, the combo of Admitted Art and Shattil discloses the method of claim 1, whereby a lower order receiver can interpret said transmitted diagonally loaded symbols as a normal OFDM frame (Page . 4 and page 5 lines 1-5, note both lower order and upper order receivers can interpret and diagonally transmitted signal).

Claim 21-25 are analogous to the features of claim 1, 2, 6, 11 and 14, thus they are rejected for the same reason used in the rejection of claims 1, 2, 6, 11 and 14.

5. Claims 8, 17, 18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Background, particularly Figures 1-3 and page 4, line 18 through page 5, line 19 (herein Admitted Art) in view of Shattil (US 2004/0141548 A1) and further in view of Joo (US 2004/0208253 A1).

Referring to claim 8, the combination of Admitted Art and Shattil disclose the method of claim 7.

The above combination does not specifically disclose where said one or more additional subcarriers are inserted to ensure that any subcarrier that was nulled by said diagonal loading is surrounded by subcarriers that are not nulled.

Joo discloses nulling subcarriers that are not diagonally loaded and inserting non-nulled subcarriers adjacent to nulled subcarriers (abstract and Par. 25).

It would have been obvious to a person of ordinary skill in the art at the time of invention to modify the method of Li in the format disclosed for the purpose of providing an efficient communication system.

Referring to claim 17, Admitted Art discloses a method for generating a plurality of long training symbols in a multiple antenna wireless communication system (Page 4-5 and Fig. 1-3), said method comprising the step of:

loading subcarriers from a single-antenna long training symbol across long training symbols associated with logically adjacent antennas in said multiple antenna wireless communication system (Page. 4-5, note that loading subcarriers is inherent in OFDM. Further note that there is at least one transmitter and one receiver, thus a multiple antenna system);

Admitted Art does not specifically disclose that the symbols are loaded diagonally.

In an Analogous art, Shattil discloses that symbols are loaded into subcarriers diagonally (Fig. 9A and Par. 0163).

It would have been obvious to a person of ordinary skill in the art at the time of invention to modify the Admitted Art such that symbols are loaded diagonally into the subcarriers, for the purpose of minimizing interference and thus providing improving the quality of transmitted signal.

The above combo does not specifically disclose nulling subcarriers in said plurality of long training symbols that are not diagonally loaded; and inserting at least one additional subcarrier to ensure that a nulled subcarrier has at least one subcarrier located on each side of said nulled subcarrier.

Joo discloses nulling subcarriers that are not diagonally loaded and inserting non-nulled subcarriers adjacent to nulled subcarriers (abstract and Par. 25).

It would have been obvious to a person of ordinary skill in the art at the time of invention to modify the combination in the format disclosed for the purpose of providing an efficient communication system.

Referring to claim 18, the combo of Admitted Art, Shattil and Joo discloses the method of claim 17, wherein said single-antenna long training symbol is an 802.11 a/g long training symbol (Admitted Art page 5, lines 5-19).

Referring to claim 20, the combo of Admitted Art, Shattil and Joo discloses the method of claim 17 and further disclose wherein a reduced number of subcarriers are inserted in at least one of said plurality of long training symbols and wherein a first long training symbol and a second long training symbol are interchanged to position at least one non-nulled subcarrier on at least one side of a nulled subcarrier (Joo, Par. 25).

It would have been obvious to a person of ordinary skill in the art at the time of invention to modify the method of Li in the format disclosed for the purpose of providing an efficient communication system.

Claims 26 and 27 are rejected for the same reason as claims 1 and 17.

Claim 28 is rejected for the same reason as claim 14.

Claims 29-30 are rejected for the same reasons as claims 17 and 14.

Claims 31-32 are rejected for the same reasons as claims 17 and 14.

Claims 33-34 are rejected for the same reasons as claims 17 and 14.

6. Claims 9 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Background Disclosure in the Specification, particularly Figures 1-3 and page 4, line 18 through page 5, line 19 (herein Admitted Art) in view of Shattil (US 2004/0141548 A1) and further in view of well known prior art (MPEP 2144.03).

Referring to claim 19, the combo of Admitted Art, Shattil and Joo discloses the method of claim 17.

The combination does not specifically disclose where said at least one additional subcarrier allows nulled subcarriers to be estimated using an interpolation-based channel estimation technique.

Examiner takes official notice of the fact using an interpolation-based channel estimation is well known in the art.

It would have been obvious to a person of ordinary skill in the art at the time of invention to modify the above combination by using the well known interpolation technique for the purpose of providing an efficient communication system.

Claim 9 is rejected for the same reasons that claim 19 is rejected.

Allowable Subject Matter

7. Claim 10 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Art Unit: 261710

The following is the examiner's statement of reasons for allowance:

The prior art fails to teach or suggest the limitation, “a reduced number of subcarriers are inserted in said at least one of plurality of long training symbols and wherein a first long training symbol and a second long training symbols are interchanged to position at least one non-nulled subcarrier on at least one side of a nulled subcarrier,” along with other limitations of the intervening claims 1 and 2.

Response to Arguments

8. Applicant's arguments with respect to claims 1-34 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fred A. Casca whose telephone number is (571) 272-7918. The examiner can normally be reached on Monday through Friday from 9 to 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Edouard, can be reached at (571) 272-7603. The fax number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR

Application/Control Number: 10/562,618

11

Art Unit: 261711

system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Fred A. Casca/

Examiner, Art Unit 2617

/Patrick N. Edouard/

Supervisory Patent Examiner, Art Unit 2617